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ABSTRACT

The Questionnaire on Student Attitude Toward Economics (QSATE-O) was administered, as a pretest in the first week of classes and again as a posttest in the final week of classes, to the students enrolled in seven sections of Economics 101 at Ohio University. Purposes of the study were to obtain measures of student attitude toward economics at the beginning and at the end of the introductory courses, and to estimate the direction as well as the extent of changes in attitude over the time period when the students were enrolled in the course. Among the major findings are the following: (1) student attitude toward economics tended to deteriorate over the time period when the students were enrolled in the course; and (2) the demand for economic knowledge and instruction in economics was lower at the conclusion of the course than at the beginning. To determine whether the QSATE-O was valid for the population of students with whom it was used, a predictive validity problem was constructed and tested. The reliability of the instrument was also measured. Results indicate that the instrument was a valid measure of student attitude and that it operated in a highly reliable manner. The original and revised forms of the questionnaire on student attitudes toward economics and a summary of statistical procedures used in the study are included in the report. (RM)

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A STUDY ON THE VALIDITY AND RELIABILITY OF A QUESTIONNAIRE ON STUDENT ATTITUDE TOWARD ECONOMICS

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A STUDY ON THE VALIDITY AND RELIABILITY OF A QUESTIONNAIRE ON STUDENT ATTITUDE TOWARD ECONOMICS*

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Teachers of introductory courses in economics have in recent years shown some interest in the variable of student attitude toward the subject of economics.[1] This interest appears to rest on the belief that present attitude influences future behavior; that present student attitude toward economics has some effect on the behavior of students in the future with respect to the subject; or, in terms of conventional consumer demand theory, that consumer taste (student attitude) is a determinant of demand for a given good or service (economic understanding or instruction in economics). The variable of student attitude toward economics assumes importance with regard to economic understanding if the attitude-behavior nexus is tenable.[2]

A number of questions emerge from this line of reasoning. What is the relationship between the attitude variable and that of economic understanding among given groups of students at various introductory course levels of instruction? Are beginning courses influencing student attitude toward economics in a manner that is likely to increase or decrease the demand among students for further economic knowledge? What effects do different pedagogical factor mixes--labor intensive courses as

compared to capital intensive courses, for example--have on student attitude as well as economic understanding? And what is the relationship between attitude and retention of economic understanding over time? Although important from the standpoint of pedagogical policy, the absence of an instrument intended to measure the student attitude variable has prevented efforts to systematically investigate these questions.

This paper affords the opportunity to report on a beginning effort to construct an instrument intended to measure this variable. Specifically, my intents here are to (1) identify and explain, in general terms and with reference to a specific case, the use of the Questionnaire on Student Attitude Toward Economics (Original Form), (2) outline and summarize the results of an effort intended to determine whether the questionnaire appears to have been a valid measure with regard to the population of students with whom it was used, (3) outline and summarize the results of an effort to determine whether the instrument appears to have been a reliable measure on the student population with whom it was used, and (4) note some concluding remarks about the questionnaire and its use.

I

The Questionnaire on Student Attitude Toward Economics (Original Form), hereafter referred to as QSATE-O, appears in Table 1.[3] The device consists of eight questions, involving the subject of economics, to which

Table 1

Questionnaire on Student Attitude Toward Economics

(Original Form)

This questionnaire is intended to determine the favorability or unfavorability of your attitude toward the subject of economics at the present time. Please respond to each of the questions by placing a check (✔) in the space to the left of the answer you consider most appropriate.

Name _____
(last) (first) (middle initial)

Date _____

1. How would you describe your present attitude toward the subject of economics?

_____1. Very unfavorable
_____2. Unfavorable
_____3. Undecided or indifferent
_____4. Favorable
_____5. Very favorable

2. How would you describe your present interest in this course?

_____1. Not at all interested
_____2. Not too interested
_____3. Undecided or indifferent
_____4. Somewhat interested
_____5. Very interested

3. How interested are you in learning (or learning more) about economics?

_____1. Not at all interested
_____2. Not too interested
_____3. Undecided or indifferent
_____4. Somewhat interested
_____5. Very interested

Table 1 (continued)

4. How interested are you in taking another course in economics?

_____1. Not at all interested
_____2. Not too interested
_____3. Undecided or indifferent
_____4. Somewhat interested
_____5. Very interested

5. How would you rank economics in comparison to other subjects you have studied on the basis of personal interest?

_____1. Economics is the least interesting subject
_____2. Economics is among the less interesting subjects
_____3. Undecided or indifferent
_____4. Economics is among the more interesting subjects
_____5. Economics is the most interesting subject

6. How would you rank economics in comparison to other subjects you have studied on the basis of its contribution (or likely contribution) to your occupational preparation?

_____1. Economics is the least important subject
_____2. Economics is among the less important subjects
_____3. Undecided or indifferent
_____4. Economics is among the more important subjects
_____5. Economics is the most important subject

7. How would you rank economics in comparison to other subjects you have studied on the basis of its contribution (or likely contribution) to your general education?

_____1. Economics is the least important subject
_____2. Economics is among the less important subjects
_____3. Undecided or indifferent
_____4. Economics is among the more important subjects
_____5. Economics is the most important subject

8. Which of the following statements best indicates your present inclination toward recommending a course in economics to a fellow student who has never studied the subject?

_____1. Definitely would not recommend a course
_____2. Would tend not to recommend a course
_____3. Undecided or indifferent
_____4. Would tend to recommend a course
_____5. Definitely would recommend a course

the student is asked to respond. The possible responses to each of the questions ranges from extreme avoidance of the subject through moderate avoidance, neutrality, and moderate approach to extreme approach toward the subject. The items--questions and responses--are worded in a manner that is thought to be appropriate to the student of introductory economics at the college level. Administered as a pretest and as a posttest in a given introductory class, the QSATE-O generates a measure of student attitude toward economics at the beginning of the course as well as at the end of the course, with a measure of change in attitude indicated by the difference between the beginning and the ending measures. The score for any one student on a given administration of the instrument is determined through weights assigned to each of the types of responses. The weight of 1 is assigned to the responses suggesting extreme avoidance; 2 is the weight given to the responses indicating moderate avoidance; 3 is assigned to the neutral responses; 4 to the moderate approach responses, and 5 to the extreme approach responses. The attitude score for an individual student is, then, the sum of the weights associated with his checked responses. The attitude score generated in this way can take a value ranging from 8 through 40, the lower score suggesting an extremely unfavorable attitude toward economics, the higher score representing an extremely favorable attitude toward the subject, and the score of 24 (the midpoint of the scale) indicating an attitude of neutrality.

During the Fall Quarter of the 1970-71 school year, the QSATE-O was administered, as a pretest in the first week of classes and again as a

posttest in the final week of classes, to the students enrolled in seven sections of Economics 101--the introductory principles course--at Ohio University.[4] The purposes of this study were to obtain measures of student attitude toward economics at the beginning and at the end of the introductory courses, and to estimate the direction as well as the extent of changes in attitude over the time period when the students were enrolled in their principles course. The population included in this study consisted of those students who submitted completed pretests and posttests; those students who did not complete both tests were excluded from the analyzed population. The number of students enrolled in the course in the combined and separate sections together with the corresponding numbers and proportions of students completing both tests are given in Table 2.

Prominent among the results generated in this study are those contained in Tables 3 through 8. Table 3 contains the pretest, posttest, and difference mean scores and the corresponding standard deviations on the OSATE-O for the combined and separate Economics 101 sections together with the results of a statistical comparison of each posttest mean with that of the pretest.[5] Table 4 provides information regarding the change in attitude toward economics over the time period when the students were enrolled in the Economics 101 course; given are the numbers of students and the proportions of each group who, as evidenced by the differences in their pretest and posttest raw scores, showed "attitude improvement" (posttest score greater than pretest score), "no change in attitude"

Table 2

Date Pertaining to the Student Population Enrolled in the Combined and Separate Economics 101 Sections and the Student Population Who Completed QSATE-0 Pretest and Posttest

Group	Number of Students Enrolled in the Course*	Number of Students Who Completed QSATE-0 Pretest and Posttest	Proportion of Students Who Completed QSATE-0 Pretest and Posttest
Combined Sections	623	380	61%
Section A	68	43	63%
Section B	128	78	61%
Section C	124	71	57%
Section D	69	45	65%
Section E	90	54	60%
Section F	76	37	49%
Section G	68	52	76%

*These figures include those students who, according to official grade reports, completed the course as evidenced by their receipt of a terminal grade (A, B, C, D, F). Those students who did not receive a terminal grade for the course are excluded from these figures.

Table 3

Data Pertaining to the Beginning Attitude, Ending Attitude, and Change in Attitude Generated from the Pretest and Posttest Administrations of the QSATE-0 Using the Group of Students in the Combined and Separate Economics 101 Sections as the Subject of Analysis

Group	N	Pretest		Posttest		Difference		Tabled t-Statistic*	Computed t-Statistic	Probability	Statistical Interpretation**
		$\bar{X}_1$	(SD)	$\bar{X}_2$	(SD)	$\bar{X}_D$	(SD)				
Combined Sections	380	28.64	(4.41)	27.11	(6.55)	-1.53	(5.81)	1.97	-5.10	$p < .01$	S
Section A	43	27.23	(3.91)	25.95	(6.60)	-1.28	(5.92)	2.02	-1.42	$.10 < p < .20$	NS
Section B	78	28.95	(4.56)	29.55	(5.46)	+0.60	(5.38)	1.99	+0.98	$.20 < p < .50$	NS
Section C	71	28.82	(4.26)	22.89	(6.66)	-5.93	(5.71)	1.99	-8.72	$p < .01$	S
Section D	45	28.27	(4.67)	26.07	(6.47)	-2.20	(5.16)	2.01	-2.86	$p < .01$	S
Section E	54	28.46	(3.92)	27.31	(5.90)	-1.15	(5.98)	2.00	-1.42	$.10 < p < .20$	NS
Section F	37	28.59	(5.20)	28.03	(6.00)	-0.56	(4.30)	2.03	-0.79	$.20 < p < .50$	NS
Section G	52	29.62	(4.33)	30.21	(5.70)	+0.59	(4.52)	2.00	+0.94	$.20 < p < .50$	NS

*Tabled $t_{.05/2,\ N-1\ df}$

**S=Significant; NS=Not Significant

Table 4

Data Pertaining to the Change in Attitude Generated from the Pretest and Posttest Administrations of the QSATE-0 Using Proportions of Students in the Combined and Separate Economics 101 Sections as the Subject of Analysis

Group	N	Attitude Improvement ($X_A < X_B$)* No.	(%)	No Change ($X_A = X_B$)* No.	(%)	Attitude Deterioration ($X_A > X_B$)* No.	(%)	Computed z-Statistic**	Probability	Statistical Interpretation***
Combined Sections	380	139	(36.6)	35	(09.2)	206	(54.2)	-3.56	$p < .01$	S
Section A	43	16	(37.2)	1	(02.3)	26	(60.5)	-1.70	$p = .08$	NS
Section B	78	38	(48.7)	5	(06.4)	35	(44.9)	+0.23	$p = .82$	NS
Section C	71	9	(12.7)	2	(02.8)	60	(84.5)	-6.01	$p < .01$	S
Section D	45	13	(28.9)	4	(08.9)	28	(62.2)	-2.19	$p = .03$	S
Section E	54	21	(38.9)	8	(14.8)	25	(46.3)	-0.44	$p = .66$	NS
Section F	37	16	(43.2)	4	(10.8)	17	(45.9)	0.00	$p = 1.00$	NS
Section G	52	26	(50.0)	11	(21.2)	15	(28.8)	+1.56	$p = .12$	NS

*X_A =pretest raw score on QSATE-0; X_B =posttest raw score on QSATE-0.

**Tabled $z_{.05/2}$ =1.96.

***S=Significant; NS=Not Significant.

Table 5

Data Pertaining to the Favorable Attitude Classification Generated from the Pretest and Posttest Administration of the QSATE-0 Using Proportions of Students in the Combined and Separate Economics 101 Sections as the Subject of Analysis

Group	N	Pretest Favorable Attitude (X_A =30-40)* No.	(%)	Posttest Favorable Attitude (X_B =30-40)* No.	(%)	Computed z-Statistic**	Probability	Statistical Interpretation***
Combined Sections	380	160	(42.1)	174	(45.8)	+1.28	p=.20	NS
Section A	43	11	(25.6)	17	(39.5)	na	na	na
Section B	78	35	(44.9)	50	(64.1)	+2.78	$p < .01$	S
Section C	71	33	(46.5)	14	(19.7)	-4.15	$p < .01$	S
Section D	45	18	(40.0)	17	(37.8)	na	na	na
Section E	54	21	(38.9)	22	(40.7)	na	na	na
Section F	37	15	(40.5)	18	(48.6)	na	na	na
Section G	52	27	(51.9)	36	(69.2)	na	na	na

*X_A =pretest raw score on QSATE-0; X_B =posttest raw score on QSATE-0.

**Tabled $z_{.05/2}$ =1.96. Cell frequencies were insufficient to perform the significance test in the cases where na (not applicable) appears.

***S=Significant; NS=Not Significant.

Table 6

Data Pertaining to the Neutral Attitude Classification Generated from the Pretest and Posttest Administrations of the QSATE-0 Using Proportions of Students in the Combined and Separate Economics 101 Sections as the Subject of Analysis

Group	N	Pretest Neutral Attitude (X_A =19-29)* No.	(%)	Posttest Neutral Attitude (X_B =19-29)* No.	(%)	Computed z-Statistic**	Probability	Statistical Interpretation***
Combined Sections	380	209	(55.0)	156	(41.1)	-4.34	$p < .01$	S
Section A	43	30	(69.8)	20	(46.5)	-2.24	$p = .03$	S
Section B	78	41	(52.6)	24	(30.8)	-3.05	$p < .01$	S
Section C	71	37	(52.1)	36	(50.7)	-0.17	$p = .87$	NS
Section D	45	24	(53.3)	20	(44.4)	-0.89	$p = .37$	NS
Section E	54	32	(59.2)	27	(50.0)	na	na	na
Section F	37	21	(56.8)	15	(40.5)	na	na	na
Section G	52	24	(46.2)	14	(26.9)	na	na	na

*X_A =pretest raw score on QSATE-0; X_B =posttest raw score on QSATE-0.

**Tabled $z_{.05/2}$=1.96. Cell frequencies were insufficient to perform the significance test in the cases where na (not applicable) appears.

***S=Significant; NS=Not Significant.

Table 7

Data Pertaining to the Unfavorable Attitude Classification Generated from the Pretest and Posttest Administrations of the QSATE-0 Using Proportions of Students in the Combined and Separate Economics 101 Sections as the Subject of Analysis

Group	N	Pretest Unfavorable Attitude (X_A =8-18)* No. (%)	Posttest Unfavorable Attitude (X_B =8-18)* No. (%)	Computed z-Statistic**	Probability	Statistical Interpretation***
Combined Sections	380	11 (02.9)	50 (13.2)	+5.69	$p < .01$	S
Section A	43	2 (04.6)	6 (14.0)	na	na	na
Section B	78	2 (02.6)	4 (05.1)	na	na	na
Section C	71	1 (01.4)	21 (29.6)	+4.47	$p < .01$	S
Section D	45	3 (06.7)	8 (17.8)	na	na	na
Section E	54	1 (01.8)	5 (09.2)	na	na	na
Section F	37	1 (02.7)	4 (10.8)	na	na	na
Section G	52	1 (01.9)	2 (03.8)	na	na	na

*X_A =pretest raw score on QSATE-0; X_B =posttest raw score on QSATE-0.

**Tabled $z_{.05/2}$ =1.96. Cell frequencies were insufficient to perform the significance test in the cases where na (not applicable) appears.

***S=Significant; NS=Not Significant.

Table 8

Data Pertaining to the Ending Attitude Generated from the Posttest Administration of the QSATE-O Using Proportions of Students in the Combined and Separate Economics 101 Sections as the Subject of Analysis

Group	N*	Favorable Attitude (X_B=30-40)** No. (%)	Unfavorable Attitude (X_B=8-18)** No. (%)	Computed z-Statistic***	Probability	Statistical Interpretation****
Combined Sections	224	174 (77.7)	50 (22.3)	+8.22	$p < .01$	S
Section A	23	17 (73.9)	6 (26.1)	na	$p = .03$	S
Section B	54	50 (92.6)	4 (07.4)	+6.13	$p < .01$	S
Section C	35	14 (40.0)	21 (60.0)	-1.01	$p = .31$	NS
Section D	25	17 (68.0)	8 (32.0)	na	$p = .11$	NS
Section E	27	22 (81.5)	5 (18.5)	+3.08	$p < .01$	S
Section F	22	18 (81.8)	4 (18.2)	na	$p < .01$	S
Section G	38	36 (94.7)	2 (05.3)	+5.36	$p < .01$	S

*This N is a subsample of the total student population comprised of those who scored in the favorable attitude classification on the posttest and those who scored in the unfavorable attitude classification on the posttest; the students who scored in the neutral attitude classification are omitted from the subsample.

**X_B=posttest raw score on the QSATE-O.

***Tabled $z_{.05/2}$ =1.96. A small sample procedure, appropriate where N is 25 or less, was used to conduct the statistical tests where na (not applicable) appears.

****S=Significant; NS=Not Significant.

(posttest score equal to pretest score), and "attitude deterioration" (posttest score less than pretest score); provided, as well, are the results of statistical comparisons of the proportion of each group showing "attitude improvement" with the proportion reflecting "attitude deterioration." Then, Tables 5, 6, and 7 focus on three attitude classifications derived from the scale generated by the QSATE-0. The "favorable attitude" classification consists of the upper 11-point interval of the scale, or those scores ranging from 30 through 40; the "neutral attitude" category is comprised of the middle 11-point interval of the scale, or scores 19 through 29; and the "unfavorable attitude" dichotomy consists of the lower 11-point interval, or that ranging from 8 through 18. Each of the Economics 101 students was assigned to one of these classifications twice, one time using the student's pretest raw score, and a second time using his posttest raw score. The numbers of students and proportions of the groups in the "favorable attitude" classification on the pretest as well as the post-test together with the results of statistical comparisons involving the pairs of proportions are given in Table 5; the same data on the "neutral attitude" category are contained in Table 6; and Table 7 provides analogous information with respect to the "unfavorable attitude" dichotomy. Finally, Table 8 summarizes student attitude toward economics in the various groups at the end of the Economics 101 course, focusing on the subsample of students having a "favorable attitude" or

an "unfavorable attitude." Given are the numbers of students and the corresponding proportions of the subsample falling into the two attitude classifications together with the results of statistical comparisons involving the pairs of proportions.

The principal conclusion suggested by the data contained in Tables 3 through 8 with respect to the combined sections is that student attitude toward economics tended to deteriorate over the time period when the students were enrolled in the introductory course. This deterioration trend is seen in the statistically significant downward shift in the mean attitude score noted in Table 3; the same trend is apparent in the data presented in Table 4 where the proportions of students showing "attitude deterioration" is significantly greater than the proportion showing"attitude improvement"; the deterioration is further suggested by the figures given in Tables 5, 6, and 7 where there is an insignificant increase in the proportion of students in the "favorable attitude" classification, a significant decrease in the proportion in the "neutral attitude" category, and a significant increase in the "unfavorable attitude" dichotomy; finally, the information in Table 8 indicates that the deterioration trend can be considered limited in that the proportion of students leaving the introductory course with a "favorable attitude" is significantly greater than the proportion leaving with an "unfavorable attitude." With regard to the separate Economics 101 sections, the attitude deterioration trend is scarcely apparent in Sections B and G, more pronounced in Sections A, D, E, and F,

and most apparent in Section C. This conclusion of deterioration, applicable to the students in the combined Economics 101 sections and in varying degrees to five of the seven separate sections, suggests that the demand for economic knowledge and instruction in economics among these students was lower at the conclusion of the introductory course than at the beginning of the course. The extent to which student attitude toward economics is an effective determinant of demand for knowledge about the subject, the retrospective inference can be made that the students analyzed here will have demanded less additional knowledge and instruction in the subject than they would have if their attitudes had shifted in the favorable rather than the unfavorable direction, assuming other factors remain constant.

II

A matter of central concern in the use of the QSATE-O is the assumption that the instrument is valid, that the questionnaire is in fact measuring the characteristic of student attitude toward economics or taste for the subject. The quality of the conclusions arrived at through the use of this instrument is dependent in large part on whether or not the validity assumption is met. Hence, the extent to which this assumption is supported, the conclusion of attitude deterioration, noted in the combined Economics 101 sections and five of the separate sections, can be considered accurate; conversely, the degree to which the validity assumption is not supported, the attitude deterioration

conclusion must be considered questionable at best.

The determination of whether the QSATE-0 appears to have been valid for the population of students with whom it was used necessitated the construction and testing of a predictive validity problem.[6] On the assumption that the true preferences of a given individual are reflected in that individual's behavior, the proposition can be made that a reasonably accurate measure of student preferences for alternative subject matters available in the academic marketplace consists of the course work mix elected by students. Accordingly, a given student's presence in an economics course is evidence of the existence of a preference for economics rather than alternative subjects available for the student's consumption. The inference can be drawn from this preference that the student's attitude toward economics is favorable relative to that toward the foregone subject areas. Alternatively, a given student's absence from enrollment in economics courses signals the student's preference for subjects other than economics. The inference, here, is that the student's attitude toward economics is unfavorable relative to his attitude toward the elected courses. This behavioral definition of attitude toward economics, employing the criterion of whether course work is taken beyond the introductory course, can serve as a benchmark to which the results on the QSATE-0 can be compared. The degree to which the instrument yields results which are consistent with the behavioral measure (that is, those students who have attitudes in the favorable direction as measured by the QSATE-0 tend to take further

course work, and those who have attitudes in the unfavorable direction as measured by QSATE-O tend not to take further course work), the questionnaire can be considered valid in the predictive sense of the term; conversely, the extent to which the instrument yields results which are inconsistent with the behavioral measure, the questionnaire must be considered invalid as a measure of student attitude toward economics. The problem, therefore, is to determine the degree to which the results obtained on the QSATE-O can be considered predictive of whether students subsequently enrolled in course work beyond the introductory course.[7]

A survey of the official transcripts of the students in the Economics 101 attitude study provided the data on whether each student pursued further course work during the six-quarter period beginning with the Winter Quarter of 1971 and ending with the Spring Quarter of 1972. A student was considered to have taken further course work if he or she had enrolled in, and completed, one or more economics course during this time; he was considered, on the other hand, to have taken no further course work if he had not enrolled in, and completed, one or more economics courses in the given time period. Table 9 summarizes for the combined and separate Economics 101 sections the numbers of students and the proportions of each group taking further course work and taking no further course work.

The predictability of the instrument was investigated using the data regarding the incidence of taking further course work and of taking no

Table 9

Data Pertaining to the Student Population in the Combined and Separate Economics 101 Sections Taking Further Course Work and Taking No Further Course Work in Economics

Group	N	Students Taking Course Work Beyond Economics 101		Students Taking No Course Work Beyond Economics 101	
		No.	(%)	No.	(%)
Combined Sections	380	265	(69.7)	115	(30.3)
Section A	43	27	(62.8)	16	(37.2)
Section B	78	58	(74.4)	20	(25.6)
Section C	71	50	(70.4)	21	(29.6)
Section D	45	27	(60.0)	18	(40.0)
Section E	54	41	(75.9)	13	(24.1)
Section F	37	23	(62.2)	14	(37.8)
Section G	52	39	(75.0)	13	(25.0)

further course work, two sets of QSATE-0 data, and the statistical techniques of mean comparison, chi square, and correlation. The two sets of QSATE-0 data were the posttest attitude scores, reflective of the students' inclination toward economics at the end of the introductory course, and the posttest attitude scores minus the pretest attitude scores, indicative of the students' change in attitude toward economics over the time period when they were enrolled in the introductory course.

As a first test of the predictability of the QSATE-0, the mean attitude scores for the subsample of students taking further course work were compared to the mean attitude scores for the subsample taking no further course work. The predictability thesis would be supported in these comparisons if the further course work group had a significantly higher mean score on the posttest attitude measure than the group taking no further course work, and if the further course work students had a significantly less negative mean attitude change score than the students taking no additional course work. Tables 10 and 11 contain the data pertaining to these two comparisons. The results given in Table 10 indicate that the students in the further course work group did score significantly higher on the posttest attitude measure than the students taking no additional courses. The students who subsequently took further economics appear, therefore, to have been more favorably inclined toward the subject at the end of the principles course than those who took no additional work in the subject. Similarly, the data in Table 11 indicate

Table 10

Data Pertaining to the Comparison of the QSATE-0 Posttest Mean Attitude Score for the Students Taking Further Course Work in Economics With the Posttest Mean Attitude Score for the Students Taking No Further Course Work in Economics

Students Taking Course Work Beyond Economics 101 (N=265) $\bar{X}_1$	(SD)	Students Taking No Course Work Beyond Economics 101 (N=115) $\bar{X}_2$	(SD)	Computed t-Statistic*	Probability	Statistical Interpretation**
28.40	(6.03)	24.18	(6.70)	5.79	$p < .01$	S

*Tabled $t_{.05/2,378} = 1.97$.

**S=Significant.

Table 11

Data Pertaining to the Comparison of the QSATE-0 Mean Attitude Change Score for the Students Taking Further Course Work in Economics With the Mean Attitude Change Score for the Students Taking No Further Course Work in Economics

Students Taking Course Work Beyond Economics 101 (N=265) $\bar{X}_1$	(SD)	Students Taking No Course Work Beyond Economics 101 (N=115) $\bar{X}_2$	(SD)	Computed t-Statistic*	Probability	Statistical Interpretation**
-0.58	(5.44)	-3.70	(6.02)	-4.74	$p < .01$	S

*Tabled $t_{.05/2,378} = 1.97$.

**S=Significant.

a significant difference in the mean attitude change scores for the two groups. The attitude toward economics of those students taking no additional course work exhibited a tendency to deteriorate more over the time span of the introductory course than that of the students taking additional economics. This initial analysis suggests that the QSATE-0 results were consistent with (rather than unrelated to or inconsistent with) the student behavior of taking or not taking additional economics courses; the questionnaire results, with respect to this student population, can be considered to have been predictive of whether or not additional economics was subsequently taken by the students in the sense that those who were more favorably disposed toward the subject at the end of the introductory course as well as those whose attitudes deteriorated less during the initial course were more inclined to take additional courses than those who were less favorably disposed toward the subject and whose attitudes deteriorated to a greater extent.

Since these mean comparisons revealed a measure of consistency between the QSATE-0 results and the students' behavior with respect to taking additional course work, further analysis was warranted to determine the extent of the consistency, or the degree to which the instrument was predictive of the students' propensity to take further course work. Accordingly, a second pair of tests involved the construction of 2 x 3 contingency tables relating posttest attitude as well as change in attitude to the incidence of taking or not taking further course work, the performance of a chi square test of independence on each set of data, and

the calculation of a contingency coefficient for each set of data.[8] These contingency tables, the results of the chi square tests, and the contingency coefficients are given in Tables 12 and 13. The data in Table 12 indicate that student attitude at the end of the principles course was significantly associated with the students' propensity to take further economics. The extent of the association is suggested by the .27 contingency coefficient. The association and some idea of its magnitude is seen, too, in the frequency data in the contingency table. Of the 174 students leaving the introductory course inclined favorably toward the subject, 83 percent did take further course work and 17 percent did not; then, 62 percent of the 156 neutrally inclined students took added courses while 38 percent did not; and 48 percent of the 50 unfavorably inclined students took more economics and 52 percent did not. Table 13 suggests that the change in attitude among the students during the introductory course, also, was significantly associated with the students' inclination to take further course work. Again, the strength of the association is suggested in the .25 contingency coefficient. The frequency data in the contingency table, here, indicates that of the 139 students whose attitudes appreciated 85 percent took further course work and 15 percent did not; 71 percent of the 35 students whose attitudes showed no change took additional courses while 29 percent did not; and 59 percent of the 206 students whose attitudes depreciated took more economics and 41 percent did not. This second set of tests suggest in another way that attitude was significantly associated with the propensity to take additional economics among the students

Table 12

Data Pertaining to the Chi Square Test of Independence Between the QSATE-0 Posttest Attitude Classifications and the Incidence of Taking Further Course Work or Not Taking Further Course Work in Economics

Course Work	Favorable Attitude (X_2 =30-40)*	Neutral Attitude (X_2 =19-29)*	Unfavorable Attitude (X_2 =08-18)*	Computed X^2-Statistic**	Probability	Statistical Interpretation***	Contingency Coefficient C
Course Work Taken Beyond Economics 101	144	97	24	29.40	$p < .01$	S	.27
Course Work Not Taken Beyond Economics 101	30	59	26				

*X_2 =posttest raw score on QSATE-0.

**Tabled $X^2_{.05,2}$=5.99.

***S=Significant.

Table 13

Data Pertaining to the Chi Square Test of Independence Between the QSATE-0 Pretest-Posttest Attitude Change Classifications and the Incidence of Taking Further Course Work or Not Taking Further Course Work in Economics

Course Work	Attitude Improvement ($X_1 < X_2$)*	No Change in Attitude ($X_1 = X_2$)*	Attitude Deterioration ($X_1 > X_2$)*	Computed χ^2 Statistic**	Probability	Statistical Interpretation***	Contingency Coefficient C
Course Work Taken Beyond Economics 101	118	25	122	26.06	$p < .01$	S	.25
Course Work Not Taken Beyond Economics 101	21	10	84				

*X_1 =pretest raw score on QSATE-0; X_2 =posttest raw score on QSATE-0.

**Tabled $X^2_{.05,2}=5.99$.

***S=Significant.

in the analyzed population. Further, the magnitude of the contingency coefficients as well as the raw data in the contingency tables indicate that the association was somewhat moderate. This moderation appears in the phenomena that sizable proportions of students who could be expected to avoid further study in economics (those in the unfavorable attitude classification, and those in the attitude deterioration category) did take additional courses, and, to a lesser extent, certain students who could be expected to take further economics (those in the favorable attitude classification, and those in the attitude improvement category) did not take additional courses. The data are, nevertheless, supportive of the conclusion that the students who left the introductory course favorably disposed toward economics and those whose attitudes improved during the course were more inclined to take additional work than the students who left the introductory course unfavorably disposed toward the subject and those whose attitudes deteriorated during the course. The results obtained from the attitude questionnaire can, therefore, be seen to have been moderately predictive of the students' propensity to take further economics.

Supporting this conclusion, as well, are the results of a third pair of tests contained in Tables 14 and 15. These tests involved the computation of point biserial correlation coefficients and determining whether the coefficients were significantly different from zero.[9] The data in Table 14, thus, indicate that the continuous variable of post-test attitude correlated with the dichotomous variable of whether or not

Table 14

Data Pertaining to the Point-Biserial Correlation Between QSATE-0 Posttest Attitude Score and the Incidence of Taking Further Course Work or Not Taking Further Course Work in Economics

	QSATE-0 Posttest (Range=8-40)		Course Work Beyond Economics 101 (0=No; 1=Yes)		Point Biseral Correlation Coefficient			
N	$\bar{X}$	(SD)	$\bar{X}$	(SD)	r_{pbi}	Computed t-Statistic*	Probability	Statistical Interpretation**
380	27.11	(6.55)	0.70	(0.46)	.30	6.11	$p < .01$	S

*Tabled $t_{.05/2,378} = 1.97$.

**S=Significant.

Table 15

Data Pertaining to the Point-Biserial Correlation Between the QSATE-0 Pretest Posttest Attitude Change and the Incidence of Taking Further Course Work or Not Taking Further Course Work in Economics

	QSATE-0 Attitude Change (Range=-24+19)		Course Work Beyond Economics 101 (0=No; 1=Yes)		Point-Biserial Correlation Coefficient	Computed t-Statistic*	Probability	Interpretation**
	$\bar{X}$	(SD)	$\bar{X}$	(SD)	r_{pbi}			
380	-1.53	(5.81)	0.70	(0.46)	.25	5.01	$p < .01$	S

*Tabled $t_{.05/2,378} = 1.97$.

**S=Significant.

further course work was taken yielded a coefficient of .30 which was significantly greater than zero. Similarly, the results in Table 15 reveal that the continuous variable of attitude change correlated with the dichotomous variable of whether or not further economics was taken generated a coefficient of .25 which was also significantly greater than zero. That the QSATE-0 results were moderately predictive of the students' propensity to take further course work is apparent in these modest though significantly positive correlation coefficients.

The tests which have been used to this point in determining the relationship between student attitude toward economics and the propensity to take further course work have employed measures associated with individual students in the analyzed population. Three additional pairs of tests were performed using measures associated with the seven sections of Economics 101 and a rank-order correlation technique.[10] The purpose of these tests was to determine the degree to which various sectional rankings based on attitude were related to the sectional ranks based on the propensity to take or avoid further course work in economics. The validity thesis will be supported in these remaining tests when the attitude rankings correlate positively with the rankings based on whether or not further course work was taken.

The fourth pair of tests, therefore, involved ranking the QSATE-0 posttest mean scores as well as the QSATE-0 mean change scores, correlating these two measures with the ranks based on the proportion of students taking further economics, and determining whether or not the resulting

correlation coefficients were statistically significant. As Tables 16 and 17 suggest, positive although insignificant rank order correlations were obtained in the two tests. Those sections which ranked high on the QSATE-0 posttest mean score and on the QSATE-0 mean change scores, also ranked high on the proportion of students taking additional course work. The relationships are, however, not strong enough to document anything other than a chance relationship between the two pairs of variables.

The fifth pair of tests, the results of which are given in Tables 18 and 19, focused on the relationships between the sectional rankings based on the proportion of students finishing the course with a favorable attitude as well as the change in the proportion of students having a favorable attitude toward economics and the ranking based on the proportion of students taking additional course work. Again, positive though insignificant rank order correlations were obtained in these tests. The sections which ranked high in terms of the proportion of students being favorably inclined toward economics at the end of the course and those which ranked high in terms of a change in the proportion of students having a favorable attitude tended to rank high in terms of the proportion of students taking additional economics. As with the previous tests, the correlation coefficients are not large enough to convincingly suggest something more than a chance relationship between these variables.[11]

The results for the sixth and final pair of tests are given in Tables 20 and 21. These tests involved correlating the sectional rankings

Table 16

Data Pertaining to the Spearman Rank-Order Correlation Between the QSATE-0 Posttest Mean Attitude Scores and the Proportions of Students Taking Further Course Work in Economics

Group	N	QSATE-0 Posttest $\bar{X}$	Rank	Proportions of Students Taking Course Work Beyond Economics 101 Percent	Rank	Spearman Rank-Order Correlation Coefficient r_s*	Statistical Interpretation**
Section A	43	25.95	6	62.8	5	.39	NS
Section B	78	29.55	2	74.4	3		
Section C	71	22.89	7	70.4	4		
Section D	45	26.07	5	60.0	7		
Section E	54	27.31	4	75.9	1		
Section F	37	28.03	3	62.2	6		
Section G	52	30.21	1	75.0	2		

*Tabled $r_{s.05,N=7} = .71$.

**NS=Not Significant.

Table 17

Data Pertaining to the Spearman Rank-Order Correlation Between the QSATE-0 Mean Attitude Change Scores and the Proportions of Students Taking Further Course Work in Economics

Group	N	QSATE-0 Change $\bar{X}$	Rank	Proportions of Students Taking Course Work Beyond Economics 101 Percent	Rank	Spearman Rank-Order Correlation Coefficient r_s*	Statistical Interpretation***
Section A	43	-1.28	5	62.8	5	.43	NS
Section B	78	+0.60	1	74.4	3		
Section C	71	-5.93	7	70.4	4		
Section D	45	-2.20	6	60.0	7		
Section E	54	-1.15	4	75.9	1		
Section F	37	-0.56	3	62.2	6		
Section G	52	+0.59	2	75.0	2		

*Tabled $r_{s.05,N=7} = .71$.

**NS=Not Significant.

Table 18

Data Pertaining to the Spearman Rank-Order Correlation between the Proportions of Students Having a Favorable Attitude at the End of the Course and the Proportions of Students Taking Further Course Work in Economics

Group	N	Proportions of Students Having a Favorable Attitude (X_2 =30-40)* Percent	Rank	Proportions of Students Taking Course Work Beyond Economics 101 Percent	Rank	Computed r_s**	Statistical Interpretation***
Section A	43	39.5	5	62.8	5	.46	NS
Section B	78	64.1	2	74.4	3		
Section C	71	19.7	7	70.4	4		
Section D	45	37.8	6	60.0	7		
Section E	54	40.7	4	75.9	1		
Section F	37	48.6	3	62.2	6		
Section G	52	69.2	1	75.0	2		

*X_2 =Posttest Raw Score on QSATE-0.

**Tabled $r_{s.05,N=7}$ =.71.

***NS=Not Significant.

Table 19

Data Pertaining to the Spearman Rank-Order Correlation Between the Change in the Proportions of Students Having a Favorable Attitude and the Proportions of Students Taking Further Course Work in Economics

Group	N	Change in the Proportions of Students Having a Favorable Attitude		Proportions of Students Taking Course Work Beyond Economics 101		Computed r_s *	Statistical Interpretation**
		Percent	Rank	Percent	Rank		
Section A	43	+13.9	3	62.8	5	.32	NS
Section B	78	+19.2	1	74.4	3		
Section C	71	-26.8	7	70.4	4		
Section D	45	-02.2	6	60.0	7		
Section E	54	+01.8	5	75.9	1		
Section F	37	+08.1	4	62.2	6		
Section G	52	+17.3	2	75.0	2		

*Tabled $r_{s.05,N=7} = .71$.

**NS=Not Significant.

Table 20

Data Pertaining to the Spearman Rank-Order Correlation Between the Proportions of Students Having an Unfavorable Attitude at the End of the Course and the Proportions of Students Taking No Further Course Work in Economics

Group	N	Proportions of Students Having an Unfavorable Attitude (X_2=08-18)* Percent	Rank	Proportions of Students Taking No Course Work Beyond Economics 101 Percent	Rank	Computed r_s**	Statistical Interpretation***
Section A	43	14.0	3	37.2	3	.71	S
Section B	78	05.1	6	25.6	5		
Section C	71	29.6	1	29.6	4		
Section D	45	17.8	2	40.0	1		
Section E	54	09.2	5	24.1	6		
Section F	37	10.8	4	37.8	2		
Section G	52	03.8	7	25.0	7		

*X_2 =Posttest Raw Score on QSATE-0.

**Tabled $r_{s.05,N=7}$ =.71.

***S=Significant.

Table 21

Data Pertaining to the Spearman Rank-Order Correlation Between the Change in the Proportions of Students Having an Unfavorable Attitude and the Proportions of Students Taking No Further Course Work in Economics

Group	N	Change in the Proportions of Students Having an Unfavorable Attitude		Proportions of Students Taking No Course Work Beyond Economics 101		Computed r_s	Statistical Interpretation**
		Percent	Rank	Percent	Rank		
Section A	43	+09.4	3	37.2	3	.71	S
Section B	78	+02.5	6	25.6	5		
Section C	71	+28.2	1	29.6	4		
Section D	45	+11.1	2	40.0	1		
Section E	54	+07.4	5	24.1	6		
Section F	37	+08.1	4	37.8	2		
Section G	52	+01.9	7	25.0	7		

*Tabled $r_{s.05,N=7} = .71$.

**S=Significant.

based on the proportion of students having an unfavorable attitude at the end of the introductory course as well as the change in the proportion of students having an unfavorable attitude toward economics with the sectional ranking based on the proportion of students taking no course work beyond Economics 101. In these cases, substantially positive and statistically significant rank order correlations were obtained. The sections which ranked high in terms of the proportion of students being negatively inclined toward economics at the end of the course and those which ranked high in terms of a change in the proportion of students being unfavorably inclined toward the subject tended to rank high on the proportion of students avoiding additional course work in economics. And in these cases, the correlation coefficients are large enough to suggest a systematic rather than a chance relationship between the variables; the likelihood is slim, in other words, that the true correlations here are zero.[12]

III

Beyond the matter of validity, a second element of concern in the use of the QSATE-0 centers on the reliability of the instrument. Are repeated administrations of the instrument to a single population likely to yield similar or dissimilar results? Does the questionnaire, in other words, appear to measure the attribute of student attitude toward economics in a consistent manner? The extent to which the

instrument generates consistent results, the questionnaire can be assumed to be reliable; conversely, if the instrument produces erratic results, the assumption of reliability is subject to question.[13]

The reliability of the QSATE-0 was estimated using the data generated in the pretest and posttest administrations of the instrument, and the "split-half" (odd-item, even-item) procedure. The results are presented in Table 22. The high Spearman-Brown reliability coefficients and the correspondingly low standard error of measurement figures suggest that the QSATE-0 was substantially reliable for this student population. The probability is consequently high that the students, individually and as a group, would have obtained scores nearly identical to those which they did obtain in repeated administrations of the questionnaire without some sort of treatment to alter student attitude.

IV

What do the findings generated in this study suggest about the validity and reliability of the QSATE-0? On the basis that the results yielded by the questionnaire turned out for the most part to be consistent with the behavioral attitude benchmark of taking further course work in economics, the conclusion appears reasonable that the instrument was a moderately valid measure of student attitude toward economics among the students within the analyzed population. Then, on the basis that the questionnaire twice yielded results which were internally consistent to a

Table 22

Data Pertaining to the Spearman-Brown Reliability
and the Standard Error of Measurement
of the QSATE-0

Administration	N	Odd Items $\bar{X}$	Odd Items (SD)	Even Items $\bar{X}$	Even Items (SD)	Pearson Product-Moment Correlation Coefficient $r_{1/2\ 1/2}$	Spearman-Brown Reliability Coefficient r_{11}	Standard Error of Measurement s_m
Pretest	380	14.37	(2.15)	14.27	(2.51)	.79	.88	1.53
Posttest	380	13.45	(3.21)	13.67	(3.55)	.87	.93	1.74

high degree, the conclusion seems warranted that the instrument operated in a highly reliable manner among these students. The tenability of these conclusions with respect to other introductory courses and to other beginning economics students is, of course, not known. However, the extent to which further study supports the findings arrived at here, the QSATE-0 can be said to measure the trait of student attitude toward economics in a roughly valid and reliable manner. It will then be possible to estimate, in a more defensible way, what happens to the student interest factor over the time period of a given introductory course, and to investigate relationships between the interest variable and the learning of economics.[14]

APPENDIX A

Questionnaire on Student Attitude Toward Economics

(Revised Form)

The questionnaire which follows is intended to determine the favorability or unfavorability of your attitude toward the subject of economics at the present time. Please respond to each of the questions by placing a check (✓) in the space to the left of the answer you consider most appropriate.

Name _____
(last) (first) (middle initial)

Date _____

1. How would you rank economics in comparison to other subjects you have studied on the basis of your personal interest in the subject?

_____1. One of the least interesting subjects
_____2. Among the less interesting subjects
_____3. Undecided or indifferent
_____4. Among the more interesting subjects
_____5. One of the most interesting subjects

2. How would you rank economics in comparison to other subjects you have studied on the basis of its contribution to your general education?

_____1. One of the least important subjects
_____2. Among the less important subjects
_____3. Undecided or indifferent
_____4. Among the more important subjects
_____5. One of the most important subjects

3. How would you rank economics in comparison to other subjects you have studied on the basis of its contribution to your occupational preparation?

_____1. One of the least important subjects
_____2. Among the less important subjects
_____3. Undecided or indifferent
_____4. Among the more important subjects
_____5. One of the most important subjects

4. Is the knowledge which you obtain from studying economics worth the time and effort that you put into studying the subject?

_____1. Definitely no
_____2. Mostly no
_____3. Undecided or indifferent
_____4. Mostly yes
_____5. Definitely yes

5. To what extent are you interested in learning (or learning more) about economics?

_____1. Not at all interested
_____2. Not too interested
_____3. Undecided or indifferent
_____4. Somewhat interested
_____5. Very interested

6. To what extent are you interested in taking additional course work in economics?

_____1. Not at all interested
_____2. Not too interested
_____3. Undecided or indifferent
_____4. Somewhat interested
_____5. Very interested

7. Do you intend to take additional course work in economics within the next two years?

_____1. Definitely no
_____2. Probably no
_____3. Undecided or indifferent
_____4. Probably yes
_____5. Definitely yes

8. What is your present inclination toward recommending a course in economics to a fellow student who has never studied the subject?

_____1. Definitely would not recommend course
_____2. Probably would not recommend course
_____3. Undecided or indifferent
_____4. Probably would recommend course
_____5. Definitely would recommend course

9. Do you agree or disagree with the following statement? "Economic understanding is essential if we are to meet our responsibilities as citizens and as participants in a basically private enterprise economy."

_____1. Strongly disagree
_____2. Disagree
_____3. Undecided or indifferent
_____4. Agree
_____5. Strongly agree

10. How would you describe your present attitude toward the subject of economics?

_____1. Very unfavorable
_____2. Mostly unfavorable
_____3. Undecided or indifferent
_____4. Mostly favorable
_____5. Very favorable

APPENDIX B

Summary of Statistical Procedures Used in This Study

The statistical methods employed in this study are summarized by table as follows:

Table 3:

The t-Test for dependent samples discussed in Robert B. Clarke, Arthur P. Coladarci, and John Caffrey, Statistical Reasoning and Procedures (Columbus, Ohio: Charles E. Merrill, 1965), pp. 232-245 was used in the statistical comparisons in Table 3. Each comparison was a two-tail test with the level of significance set at .05 and the degrees of freedom equal to N-1. The null hypothesis,

H_0: $u_2-u_1=0$,

was tested against the alternative hypothesis,

H_1: $u_2-u_1\neq 0$,

through the computation of Student's t-Statistic using the following formula:

$$t = \frac{\bar{X}_2 - \bar{X}_1 - 0}{s_{\bar{X}_1 - \bar{X}_2}} .$$

In each case this computed t-statistic was compared to the tabled t-statistic,

$t_{.05/2,\ N-1\ df}$.

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

Table 4:

The Sign Test for large samples discussed in Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956), pp. 68-75 was used in the statistical comparisons in Table 4. Each comparison was a two-tail test with the level of significance set at .05. The null hypothesis,

$$H_0: \; p\,(X_A < X_B) = p\,(X_A > X_B) = 1/2,$$

was tested against the alternative hypothesis,

$$H_1: \; p\,(X_A < X_B) \neq p\,(X_A > X_B) \neq 1/2,$$

through the computation of the z-statistic using the following formula:

$$z = \frac{(x \pm .5) - 1/2\,N}{1/2\sqrt{N}},$$

In each case the computed z-statistic was compared to the tabled z-statistic,

$$z_{.05/2} = 1.96.$$

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

Tables 5, 6, and 7:

The significance test for the difference between two correlated proportions discussed in George A. Ferguson, Statistical Analysis in Psychology and Education (2nd Edition; New York: McGraw-Hill, 1966), pp. 178-181 was used in the statistical comparisons in Tables 5, 6, and 7. Each comparison was a two-tail test with the level of significance set at .05. The null hypothesis,

$$H_0: \; p_1 = p_2 = 1/2,$$

was tested against the alternative hypothesis,

$$H_1: \; p_1 \neq p_2 \neq 1/2,$$

through the computation of the z-statistic using the following formula:

$$z = \frac{D - A}{\sqrt{A + D}} .$$

In each case the computed z-statistic was compared to the tabled z-statistic,

$$z_{.05/2} = 1.96.$$

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

This test could not be employed in those sections where the combined frequency in cells A and D was less than 20 (Ferguson, p. 180).

Table 8:

The Binomial Test for the one-sample case discussed in Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956), pp. 35-42 was used in the statistical comparisons in Table 8. Each comparison was a two-tail test with the level of significance set at .05. The null hypothesis,

$$H_0: \quad P_1 = P_2 = 1/2,$$

was tested against the alternative hypothesis,

$$H_1: \quad P_1 \neq P_2 \neq 1/2,$$

through the computation of a z-statistic using the following formula:

$$z = \frac{(x \pm .5) - NP}{\sqrt{NPQ}} .$$

In each case the computed z-statistic was compared to the tabled z-statistic,

$$z_{.05/2} = 1.96.$$

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

Where the N in the subsample was 25 or less a small sample procedure was used to carry out the test (Siegel, pp. 38-40).

Tables 10 and 11:

The t-Test for independent samples discussed in Robert B. Clarke, Arthur P. Coladarci, and John Caffrey Statistical Reasoning and Procedures (Columbus, Ohio: Charles E. Merrill, 1965), pp. 224-229 was used in the statistical comparisons in Tables 10 and 11. Each comparison was a two-tail test with the level of significance set at .05 and the degrees of freedom equal to N_1+N_2-2. The null hypothesis,

$$H_0: \ u_1-u_2=0,$$

was tested against the alternative hypothesis,

$$H_1: \ u_1-u_2 \neq 0,$$

through the computation of student's t-statistic using the following formula:

$$t = \frac{\bar{X}_1 - \bar{X}_2 - 0}{s_{\bar{X}_1 - \bar{X}_2}} .$$

In each case this computed t-statistic was compared to the tabled t-statistic,

$$t_{.05/2,\ N_1 + N_2 - 2\ df}.$$

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

Tables 12 and 13:

The Chi Square Test of Independence for the two-variable case discussed in Robert B. Clarke, Arthur P. Coladarci, and John Caffrey, Statistical Reasoning and Procedures (Columbus, Ohio: Charles E. Merrill, 1965), pp. 344-352, 358 was used for the tests given in Tables 12 and 13. Each test was a one-tail test with the level of significance set at .05 and the degrees of freedom equal to (k - 1) times (r - 1), where k is the number of columns in the contingency table and r is the number of rows in the contingency table. The null hypothesis,

H_0: The incidence of taking course work beyond Economics 101 was independent of student attitude toward economics,

was tested against the alternative hypothesis,

H_1: The incidence of taking course work beyond Economics 101 was associated with student attitude toward economics,

through the computation of the X^2 -statistic using the following formula:

$$X^2 = \sum \frac{(O-E)^2}{E} .$$

In each case this computed X^2-statistic was compared to the tabled X^2-statistic,

$$X^2_{.05,\ (k-1)\ (r-1)\ df}.$$

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

The computed X^2 statistic was then used to determine the contingency coefficient (C) as follows:

$$C = \sqrt{\frac{X^2}{N + X^2}} .$$

Tables 14 and 15:

The t-Test for the significance of a point biserial correlation coefficient discussed in George A. Ferguson, Statistical Analysis in Psychology and Education (2nd Edition; New York: McGraw-Hill, 1966), pp. 239-242 was used for the tests in Tables 14 and 15. Each test was a two-tail test with the level of significance set at .05 and the degrees of freedom equal to N-2. The null hypothesis,

H_0: $r_{pbi} = 0$,

was tested against the alternative hypothesis,

H_1: $r_{pbi} \neq 0$,

through the computation of Student's t-statistic using the following formula:

$$t = r_{pbi} \sqrt{\frac{N - 2}{1 - r_{pbi}^2}} ,$$

In each case this computed t-statistic was compared to the tabled t-statistic,

$t_{.05/2,\ N-2df}$.

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

Tables 16 through 21:

The test for the significance of the Spearman rank correlation coefficient for small samples ($N < 10$) discussed in Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956), pp. 202-213 was used in the statistical tests in Tables 16 through 21. Each test was a one-tail test with the level of significance set at .05 and N equal to 7. The null hypothesis,

H_0: $r_s = 0$,

was tested against the alternative hypothesis,

H_1: $r_s \neq 0$,

through a comparison of the computed r_s with the tabled value given in Siegel, p. 284,

$r_{s.05,N=7}$.

The null hypothesis was accepted when the computed statistic was less than the tabled statistic; conversely, the null hypothesis was rejected and the alternative hypothesis accepted when the computed statistic was equal to or greater than the tabled statistic.

Table 22:

The subdivided test or split-half reliability procedure discussed in Robert L. Thorndike, and Elizabeth Hagen, Measurement and Evaluation in Psychology and Education (3rd ed.; New York: John Wiley and Sons, 1969), pp. 182-185, 187-193 was employed here. Each administration of the test was subdivided into two parts, one consisting of the odd numbered items (1, 3, 5, 7, 9) and the other consisting of t[illegible]en

numbered items (2, 4, 6, 8, 10). A Pearson product-moment correlation coefficient ($r_{1/2\ 1/2}$) was computed between the two resulting distributions. The reliability coefficient (r_{11}) was then computed using the Spearman-Brown Prophecy Formula,

$$r_{11} = \frac{2r_{1/2\ 1/2}}{1 + r_{1/2\ 1/2}} .$$

The standard error of measurement (s_m) for each test administration was calculated using the standard deviation of the test scores (s_t) and the calculated reliability coefficient (r_{11}),

$$s_m = s_t\sqrt{1 - r_{11}} .$$

FOOTNOTES

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[1]The variable of student attitude toward economics was a point of interest in a conclusion noted by G. L. Bach and Phillip Saunders: "These findings emphasize again the well-known psychological principle that 'learning' unsupported by motivation and reinforcement through repeated use or other means has a very short half-life. If our college courses don't develop student interest in economics for the years to come and if the analysis we teach isn't usable and used by students on their own after college, there is little reason to expect much to last, however elegant the analysis or important the descriptive material in the course." G. L. Bach and Phillip Saunders, "Economic Education: Aspirations and Achievements," American Economic Review, LV (June 1965), 354-355.

Various notions of student attitude toward economics have been subject to limited investigation in a number of recent studies. Among such studies are Richard Attiyeh and Keith G. Lumsden, "Some Modern Myths in Teaching Economics," American Economic Review, LXII (May 1972), 429-433; Campbell R. McConnell, "An Experiment With Television in the Elementary Course," American Economic Review, LVIII (May 1968), 469-482; Campbell R. McConnell and Charles Lamphear, "Teaching Principles of Economics Without Lectures," The Journal of Economic Education, 1 (Fall, 1969), 33-45; Donald W. Paden and M. Eugene Moyer, "Some Evidence on the Appropriate Length of the Principles of Economics Course," The Journal of Economic Education, 2 (Spring 1971), 131-137; Phillip Saunders and G. L. Bach, "Lasting Effects of Introductory Economics: An Exploratory Study," The Journal of Economic Education, 1 (Spring 1970), 143-149; and Dennis J. Weidenaar and Joe A. Dodson, Jr., "The Effectiveness of Economics Instruction in Two-Year Colleges," The Journal of Economic Education, 4 (Fall 1972), 5-12.

[2] An interesting introductory volume on attitude and behavior in the classroom is Robert F. Mager, Developing Attitude Toward Learning (Palo Alto, California: Fearon Publishers, 1968).

[3] The QSATE-0, which generates a Likert summated-rating scale, was constructed along the lines suggested in Allen L. Edwards, Techniques of Attitude Scale Construction (New York: Appleton-Century-Crofts, 1957), pp. 149-171. A revised and expanded version of the instrument is given in Appendix A of this paper. This revised questionnaire is currently being tested.

[4] The Economics 101 courses, employing the conventional textbook-lecture method of instruction, focused on theoretical and policy dimensions of national income analysis. The seven sections were taught by six different instructors, all having professorial rank. P. A. Samuelson, Economics (8th ed.; New York: McGraw-Hill, 1970) was used as the textbook in all the sections.

[5] The statistical procedures employed in this study, together with the sources of these procedures, are summarized in Appendix B of this paper.

[6] The idea of predictive or criterion-related validity is discussed in Robert L. Thorndike and Elizabeth Hagen, Measurement and Evaluation in Psychology and Education (3rd ed.; New York: John Wiley and Sons, 1969), pp. 166-174, and in Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, 1964), pp. 447-448.

[7] One might be inclined to question the behavioral definition of attitude--that is, the incidence of taking or not taking further course work--on the grounds that some students who really dislike economics take course work in the area because they are institutionally required to do so, and that some students who like the subject are unable to take courses because their programs are full of non-economics requirements. While there may be an element of truth in these arguments, there is as well a counter argument to each. For the unappreciative students enrolled in courses in economics, it is apparent that their dislike of the subject is not sufficient to alter their course selection behavior in the direction of courses alternative to economics; the presence of students in economics courses is thus suggestive of their preferences for economics over alternative subjects available to the students. For the appreciative students not enrolled in economics, it is apparent that their like of the subject is not sufficient to alter their course

selection behavior in the direction of additional economics courses; the absence of students in economics is thus suggestive of their preferences for alternative subjects over economics.

[8]The contingency coefficient (C) appearing in Tables 12 and 13 is analogous to the Pearson-product-moment correlation coefficient in that it is indicative of the degree of association between two variables. This index of association, however, differs from the correlation coefficient in that the range of possible values for C runs from 0 to something approaching +1.00, the latter limit varying with the size of the contingency table or the number of possible scores for each variable. For purposes of interpretation, then, the closer C is to 0, the more independent the two variables are; the closer C is to +1.00, the more associated the two variables are; too, C is considered significantly greater than 0 when the obtained X^2, from which C is computed, is found to be statistically significant, and C is not significantly greater than 0 when the computed X^2 is found to be statistically insignificant. For a detailed discussion of the contingency coefficient see Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956), pp. 196-202.

[9]When a product-moment correlation is computed between two variables, one of which is continuous and the other of which is dichotomous, the resulting coefficient is frequently termed a point biserial correlation coefficient. This index of association is interpreted in the same manner as the ordinary product-moment coefficient. The point biserial coefficient is discussed in some detail in George A. Ferguson, Statistical Analysis in Psychology and Education (2nd ed.; New York: McGraw-Hill, 1966), pp. 239-242.

[10]The Spearman rank-order correlation coefficient (r_s) is likewise interpreted in the same way as the product-moment correlation coefficient. This measure of association is discussed in Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956), pp. 202-213.

[11]Surprising and counter to the thesis of this paper is the finding that the section wherein the attitude deterioration trend was most apparent, section C, did not have the expected low proportion of students taking further course work or a high proportion of students avoiding further course work.

[12] A cursory comparison of the fifth and sixth pairs of tests suggests that the proportion of students having an unfavorable attitude toward economics as a predictor of avoidance of additional course work was more satisfactory than the proportion of students having a favorable attitude toward economics as a predictor of taking additional courses in the subject.

[13] The idea of reliability is discussed in Robert L. Thorndike and Elizabeth Hagen, Measurement and Evaluation in Psychology and Education (3rd ed.; New York: John Wiley and Sons, 1969) pp.177-199, and in Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, 1964), pp. 429-443.

[14] The QSATE-O was found, in this paper, to be moderately valid as a predictor of the propensity among students to take further course work in economics using mean-comparison, chi-square, and simple correlation techniques; the instrument was, as well, found to be highly reliable. Another paper reports the results of an effort to explain student consumption of economics in terms of a number of independent variables, including various attitude measures, using multiple regression analysis; the population for this second study consists of 311 of the 380 students analyzed here. This paper is L. Karstensson and R. K. Velder, "A Note on Attitude as a Factor in Learning Economics," Research Paper No. 160, Department of Economics, Ohio University, Athens, Ohio.